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*Indian Standard*

SHIPBUILDING — MAGNETIC COMPASSES  
AND BINNACLES — GLOSSARY OF TERMS

( *First Revision* )

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**BUREAU OF INDIAN STANDARDS**  
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## FOREWORD

This Indian Standard ( First Revision ) was adopted by the Bureau of Indian Standards on 16 August 1989, after the draft finalized by the Marine Instruments and Safety Aids Sectional Committee had been approved by the Transport Engineering Division Council.

Use of correct terminology for magnetic compasses and binnacles is necessary for navigating officers and for properly implementing the various testing procedures adopted by the compass tester.

This standard was first published in 1969. Over the years the definitions of many of the terms have either undergone change or gone out of use. This revision has been undertaken to make it up-to-date and also to include definitions of some new terms such as, transmitting system, off-course alarm, angle of yaw, quadrantal correctors and pelorus.

The terms used in this standard are based on:

ISO 1069 - 1973 'Magnetic compasses and binnacles for sea navigation — Vocabulary', issued by the International Organization for Standardization ( ISO ).

BSMA 2 : Part 4 : 1985 'Magnetic compasses and binnacles : Part 4 Glossary of terms', issued by the British Standards Institution ( BSI ).

## *Indian Standard*

# SHIPBUILDING — MAGNETIC COMPASSES AND BINNACLES — GLOSSARY OF TERMS

( *First Revision* )

### 1 SCOPE

**1.1** Gives the definition of terms relating to magnetism, mariner compasses, binnacles, azimuth reading devices and the siting of compasses on board ships.

### SECTION 1 MAGNETISM

#### *11 Theoretical definitions*

<i>No.</i>	<i>Terms</i>	<i>Definition</i>
11 001	magnetic poles	The two points, near the opposite ends of a magnetized bar, at which the bar's magnetism appears to be concentrated. These two points or poles are conventionally marked in red upon the North seeking end of the bar and in blue upon the South seeking end of the bar.
11 002	permanent magnetism	a) Magnetism induced in hard iron, which remains constant after the magnetizing field has been removed. b) That part of the ship's magnetism which remains reasonably constant over a space of years, when magnetic stability of the ship has been attained.
11 003	sub-permanent magnetism	a) Magnetism induced in intermediate iron, which remains after the magnetizing field has been removed, but subsequently fades away. b) That part of the ship's magnetism which is induced when the ship remains on one heading for a long time. It will fade in a fairly short time after the heading has changed.
11 004	transient magnetism; induced magnetism	a) Magnetism which is induced in soft iron when the same is placed in a magnetic field, and that will cease to exist when the magnetic field is removed. The strength and direction of the transient magnetism will depend on the position of the material in the magnetic field. b) That part of the ship's magnetism which changes with alteration of the ship's heading, heeling and magnetic latitude.
11 005	magnetic receptivity	The physical quantity characterizing the capacity of a material to vary its magnetic moment under the influence of an external magnetic field.
11 006	magnetic meridian	Direction of magnetic field in the measuring station which is measured with a magnetometer.

#### *12 Magnetic properties*

12 001	permeability	The capacity of magnetic materials to acquire magnetism when placed in a magnetic field.
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No.	Terms	Definition
12 002	coercivity	The capacity of a magnet to retain permanent magnetism when placed in a magnetic field of inverse direction. It is measured by the strength of the reverse field required to reduce the magnetization of a fully magnetized magnet to zero.
12 003	remanence	Permanent magnetism which persists in a fully magnetized ferromagnetic material after the magnetic field has been removed.
12 004	residual magnetism	Magnetism ( induction ) retained by ferro-magnetic bodies after the magnetizing force has been removed.
<b>13 Earth's magnetism</b>		
13 001	total magnetic force of the earth	The local value of the total magnetic force of the earth.
13 002	line of total magnetic force of earth	The direction in which the magnetic axis of a magnetized needle, freely suspended at its centre of gravity in the earth's magnetic field, will align itself.
13 003	H	The symbol commonly used to denote the horizontal component of the total magnetic force of the earth. It is the directive force which acts on a compass magnetic element when the latter is affected only by the earth's magnetic field.
13 004	Z	The symbol commonly used to denote the vertical component of the total magnetic force of the earth.
13 005	dip	Angle in the vertical plane between the direction of the line of total magnetic force of the earth and the horizontal plane. The dip is zero at the magnetic equator and 90° at the magnetic poles. The dip is positive when the north seeking end of a freely suspended magnetized needle is depressed, negative when elevated.
13 006	variation	The angle orientated in the horizontal plane between magnetic North and geographic true North. It is said to be easterly ( or plus ) when magnetic North is to the right, or East, of true North; westerly ( or minus ) when magnetic North is to the left, or West, of true North.
<b>14 Magnetic material</b>		
14 001	hard iron	A ferro-magnetic material characterized by its ability to acquire permanent magnetism.
14 002	intermediate iron	A ferro-magnetic material characterized by its ability to acquire sub-permanent magnetism and which may be classified, according to its magnetic behaviour, between hard iron and soft iron.
14 003	soft iron	A ferro-magnetic material characterized by its ability to acquire transient magnetic properties when placed in a magnetic field, and to change its magnetic conditions with change in the strength or the direction of the field or both. NOTE — The magnetic properties induced in soft iron are minimum when the magnetic field is removed.
14 004	non-magnetic materials	Those materials which acquire negligible magnetic properties, either transient or permanent, when placed in a magnetic field or subjected to a magnetization process.

No.	Terms	Definition
<b>15 Magnetic characteristics relative to the ship's compass position</b>		
15 001	H	The symbol for directive force commonly used to denote the horizontal component of the total magnetic force at the compass position, for any one direction of the ship's head.
15 002	mean directive force	The mean value of the horizontal component of the total magnetic forces in the magnetic meridian at the compass position, obtained from any even number of equally spaced headings. It is equal to H or to the mean of $H \cos(\text{deviation})$ for all directions of the ship's head.
15 003	$\lambda$	Greek lambda, the symbol used to denote the ratio of the mean directive force to the horizontal component of the total magnetic force of the earth.

## SECTION 2 THE MARINER'S COMPASS

### 21 General definitions

21 001	compass	An instrument designed to seek a certain direction in azimuth and to hold that direction permanently.
21 002	magnetic compass	A compass which depends, for its directional properties, upon the magnetism of the earth.
21 003	liquid compass	A magnetic compass whose directional system is immersed in liquid.
21 004	dry card compass	A magnetic compass whose directional system is not immersed in liquid.
21 005	hemispherical compass	A liquid magnetic compass having a transparent hemispherically shaped upper cover.
21 006	aperiodic compass	A magnetic compass in which the directional system, after being deflected from its heading, does not oscillate through a complete period before returning to its heading.
21 007	standard compass	A magnetic compass which provides the primary means of navigating a ship.
21 008	steering compass	A magnetic compass used by the Helmsman when steering a ship.
21 009	stand-by steering compass	A magnetic compass which provides a secondary heading reference for steering a ship.
21 010	emergency compass	A magnetic compass fitted for the purpose of conning or steering a ship after breakdown of all other means of doing so.
21 011	overhead compass	A direct reading indicating compass viewed from the underside and normally fitted in the deck cover.
21 012	periscopic compass	A magnetic compass with optical means to view the compass card, or part thereof that indicates the compass heading from a place below the compass position, where the height of the compass bowl can be adjusted.
21 013	projector compass	A magnetic compass in which the image of the card is projected by an optical system, as a whole or in part, on to a directly viewed screen.



No.	Terms	Definition
21 014	reflector compass	A magnetic compass in which the card can be read, as a whole or in part, by means of a reflecting system.
21 015	transmitting compass; master compass	A magnetic compass which transmits the compass indications to repeater instruments.
21 016	automatic steering compass	A magnetic compass specially designed to feed an autopilot.
21 017	magnetic control element; magnetic reference unit; transmitting element	A magnetic element specially designed for either feeding an autopilot for automatic steering, or controlling an off-course alarm unit, or transmitting the course to repeater compasses or feeding other devices.
21 018	transmitting system	A system to transmit heading information to equipment in other parts of the vessel.
21 019	off-course alarm	A warning system to indicate when a vessel deviates from its course by a predetermined amount.
<b>22 Component parts</b>		
<b>221 The bowl</b>		
22 101	compass bowl	A container made of non-magnetic material and designed to house the directional system of a compass.
22 102	gimbal	A device designed to support the compass bowl and to allow it freedom of movement about the fore-and-aft and the thwartship axes of the ship, so that the suspended compass is permitted to seek a horizontal position regardless of the ship's motion.
22 103	lubber mark; lubber line	Index mark against which the compass heading is read. It is situated inside the compass bowl and fitted in the fore-and-aft line.
22 104	pivot	A device fitted in the centre of the compass bowl for the purpose of supporting the directional system, while allowing the latter to rotate freely about the pivot point.
22 105	verge ring	A ring for retaining the top glass cover of the compass bowl. It may be graduated in degrees.
<b>222 The card</b>		
22 201	compass card	A graduated disc of suitable material attached to the magnetic element of the compass.
22 202	compass needle	A specially constructed magnet, used in the magnetic element of a magnetic compass.
22 203	magnetic element	The directive element of the directional system.
22 204	pivot cap; pivot bearing	A cap made from natural or synthetic jewelstone, ceramic, or any similar hard material, fitted in the centre of the compass card, and which rests on the pivot point in the compass bowl.
22 205	float	A structure giving a degree of buoyancy to the directional system in the liquid in which it is immersed.
22 206	directional system	An assembly usually consisting of compass card, magnetic element, pivot bearing and float, freely supported on, or by, a pivot and which, under the influence of a magnetic field, settles in constant alignment with the direction of that field.

<i>No.</i>	<i>Terms</i>	<i>Definition</i>
223	Graduation of the compass card	
22 301	graduations	A circular scale, drawn at the outer edge of the compass card, divided in degrees, and marked with the cardinal points.
22 302	point	A direction mark, optionally allowed on compass cards. There are 32 points to a complete circle, equally spaced around the card, so that the arc between two adjacent points is $11^{\circ} 15'$ .
22 303	cardinal points	These are North, East, South, West. They are marked on the compass card by the capital letters N, E, S and W respectively.  NOTE — The North point may alternatively be indicated by a suitable emblem.
22 304	inter-cardinal points	These are north-east, south-east, south-west, north-west, or quadrantal points marked with the capital letters NE, SE, SW and NW respectively.
23	Compass testing	
231	Testing equipment	
23 101	testing stand	An instrument, or an assembly of instruments, used for testing and for determining the errors of a magnetic compass.
232	The errors of the card	
23 201	collimation error	An error due to inaccuracies of orientation of the North-South diameter of the card relative to the magnetic axis of the magnetic element.
23 202	eccentricity error	An error due to eccentricity of the pivot or pivot cap in the directional system.
23 203	graduation error; card error	An error due to inaccuracies in the graduation of the card.
23 204	directional error	An error of the directional system, being the algebraic sum of collimation error, eccentricity error and graduation error.
233	The card in the bowl	
23 301	lubber error	The angle between the vertical plane passing through the fore-and-aft gimbals axis and the vertical plane passing through the lubber mark and the centre of rotation of the card.
23 302	friction error	An error due to friction interfering with the free movement of the directional system.
23 303	swirl error	When a compass bowl is rotated at a constant speed, the swirl error is the difference between the indication of the directional system under such conditions and the indication when the compass bowl is at rest.
23 304	induction error	An error due to magnetic induction in the soft iron connectors by the magnets in the directional system.
234	Miscellaneous	
23 401	period	The length of time for a complete oscillation of a directional system, in a horizontal plane.
23 402	half-period	The length of time measured between the first two consecutive passes of the original position of the card, after it has been deflected.

<i>No.</i>	<i>Terms</i>	<i>Definition</i>
<b>24 Compass errors and their adjustment</b>		
<b>241 Deviation and compass error</b>		
24 101	deviation	The angle in the horizontal plane between magnetic North and compass North, as indicated by a magnetic compass when installed on board. It is said to be easterly, or plus, when compass North is to the right, or East, of magnetic North; westerly, or minus, when compass North is to the left, or West, of magnetic North.
24 102	total compass error	Algebraic sum of variation and deviation.
24 103	coefficient A	The algebraic mean of the compass deviations on not less than 8 headings, equally spaced round the compass card.
24 104	coefficient B	$\frac{\text{deviation on E} - \text{deviation on W}}{2}$
24 105	coefficient C	$\frac{\text{deviation on N} - \text{deviation on S}}{2}$
24 106	coefficient D	$\frac{\left( \begin{array}{c} \text{deviation on NE} + \\ \text{deviation on SW} \end{array} \right) - \left( \begin{array}{c} \text{deviation on SE} + \\ \text{deviation on NW} \end{array} \right)}{4}$
24 107	coefficient E	$\frac{\left( \begin{array}{c} \text{deviation on N} + \\ \text{deviation on S} \end{array} \right) - \left( \begin{array}{c} \text{deviation on E} + \\ \text{deviation on W} \end{array} \right)}{4}$
24 108	coefficient J; heeling error coefficient	The change in compass deviation per degree of list of the ship to starboard when heading North by compass.
24 109	heeling error	A deviation caused by the list of the ship from its normal upright attitude.
24 110	acceleration error	A deviation due to the action of acceleration when the ship is pitching and rolling.  It arises when there is a difference in friction between the gimbal axes or when there is an inequality of the card or liquid inertia about the horizontal axes.
<b>242 Compass adjusting</b>		
24 201	compass adjustment	Process of counteracting the effects of the magnetism of the ship, at the compass position, by the application of correcting devices, whereby the compass deviation is reduced.
24 202	compass calibration	Determination and recording of the deviations of the compass on various headings.
24 203	swinging ship	The process of manoeuvring the ship for compass adjustment or calibration.
24 204	residual deviations	Deviations of the compass, which remain after adjustment.
24 205	deviation table	A record of residual deviations on headings equally spaced around the compass card, in which the deviation is read against the compass heading.
24 206	deviation curve	A curve, which connects the residual deviations recorded during the compass calibration, drawn in a diagram in which the deviations are plotted against the compass headings.

<i>No.</i>	<i>Terms</i>	<i>Definition</i>
24 207	deflector	An instrument used to compare the horizontal component of the total magnetic force at the compass position, on the cardinal headings, to reduce deviation.
24 208	heeling error instrument	An instrument used to measure the dip and to determine the position of the heeling error corrector.
24 209	degaussing	The neutralizing of the ship's magnetic field. When a ship is degaussed by coils, changes in the resultant magnetic field at the compass position are usually compensated by compass corrector coils fitted to the compass binnacle and linked to the ship's degaussing equipment.
<b>25 Navigation ( the compass at sea )</b>		
25 001	heading	The instantaneous direction of the longitudinal axis of a craft, measured in the horizontal plane.
25 002	angle of yaw	Rotation about the normal axis. It is named starboard ( or positive ) when clockwise if viewed in the direction of the axis.
<b>SECTION 3 THE BINNACLE</b>		
30 001	binnacle	A fixed stand for supporting a compass bowl incorporating arrangements for housing or supporting devices for compass adjustment and illumination as necessary.
30 002	Flinders bar	A cylindrical soft iron bar, vertically mounted on the binnacle in a container adjacent to the compass, used to counteract the effects of the magnetism induced in the vertical soft iron parts in a ship.
30 003	quadrantal correctors	Soft iron correctors so arranged to neutralize coefficient D and/or coefficient E.
<b>SECTION 4 THE AZIMUTH READING DEVICE</b>		
40 001	azimuth reading device; azimuth circle; azimuth instrument; and azimuth sight	A device usually mounted on, or attached to, a compass bowl for measuring the azimuth of a celestial body or the bearing of a distant object. If the verge ring of the compass is suitably graduated the bearing relative to the ship's head can also be read.
40 002	pelorus	A device for taking bearings independently of the compass.
<b>SECTION 5 SITING OF THE COMPASS</b>		
50 001	safe distance	The minimum distance between a magnetic compass and an item of magnetic or electrical equipment, or inductive circuits, considered necessary in order to eliminate or greatly reduce interference with the performance of the compass.
50 002	magnetic screening	Magnetic materials surrounding the region in which a magnetic compass is located and which reduce the magnetic field at the compass position.

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